

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1-70. (canceled)

71. (currently amended) A semiconductor device having a semiconductor multi-layer structure which includes at least an active layer including at least one luminescent layer of  $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{N}$  ( $0 < x < 1$ ,  $0 \leq y \leq 0.2$ ), and at least a part of said at least one luminescent layer acting as at least a quantum well, wherein said semiconductor device satisfies at least one of:

a first condition that a threshold mode gain of each of said at least quantum well is more than  $12 \text{ cm}^{-1}$ , and

a second condition that said semiconductor device has an internal loss " $\alpha_i$ " ( $\text{cm}^{-1}$ ) which satisfies  $\alpha_i > 12 \times n - \alpha_m$  ( $\text{cm}^{-1}$ ), where " $\alpha_m$ " is a mirror loss, and "n" is a number of said at least quantum well; and

a third condition that said semiconductor device has a slope efficiency "S" (W/A) which satisfies:  $S < 3 \times \{ \alpha_m / (12 \times n) \} \times [ \{ (1 - R_1) \sqrt{R_2} \} / \{ (1 - \sqrt{R_1 R_2}) \times (\sqrt{R_1} + \sqrt{R_2}) \} ]$ , where " $R_1$ " is a first reflectance of a first cavity facet, from which a light is emitted, " $R_2$ " is a second reflectance of a second cavity

facet opposite to said first cavity facet, " $\alpha_m$ " is a mirror loss, and "n" is a number of said at least quantum well, and

wherein said semiconductor device further satisfies at least one of:

a fourth condition that a differential gain " $dg/dn$ " of said at least active layer satisfies  $dg/dn \geq 1.0 \times 10^{-20} \text{ (m}^2\text{)}^{-1}$ ; and

a fifth condition that standard deviations of microscopic and macroscopic fluctuations in a band gap energy of said at least luminescent layer are not more than ~~[[of]]~~ 40 meV.

72-74. (canceled)

75. (previously presented) The semiconductor device as claimed in claim 71, wherein said semiconductor device has a cavity length "L" of not less than 1000 micrometers, and said first reflectance " $R_1$ " is not more than 20%, said second reflectance " $R_2$ " is not less than 80% and less than 100%, and said slope efficiency "S" satisfies  $S < 2.1/n \text{ (W/A)}$ .

76. (previously presented) The semiconductor device as claimed in claim 71, wherein said luminescent layer has a photoluminescence peak wavelength distribution of not more than 40 meV.

77. (original) The semiconductor device as claimed in claim 71, wherein said semiconductor multi-layer structure comprises a gallium-nitride-based multi-layer structure.

78. (original) The semiconductor device as claimed in claim 77, wherein said gallium-nitride-based multi-layer structure extends over a gallium-nitride-based substrate.

79. (original) The semiconductor device as claimed in claim 77, wherein said gallium-nitride-based multi-layer structure extends over a sapphire substrate.

80. (original) The semiconductor device as claimed in claim 77, wherein said gallium-nitride-based multi-layer structure extends over a substrate having a surface dislocation density of less than  $1 \times 10^8$  /cm<sup>2</sup>.

81-120. (canceled)

121. (previously presented) The semiconductor device as claimed in claim 71, wherein a standard deviation " $\Delta_x$ " in the "microscopic fluctuation" of the indium composition is not more than 0.067.

122. (previously presented) The semiconductor device as claimed in claim 121,

wherein said semiconductor device has a slope efficiency "S" (W/A) which satisfies:

$$S < 3 \times \{ \alpha_m / (12 \times n) \} \times [ \{ (1 - R_1) \sqrt{R_2} \} / \{ (1 - \sqrt{R_1 R_2}) \} \times ( \sqrt{R_1} + \sqrt{R_2} ) ]$$
, where " $R_1$ " is a first reflectance of a first cavity facet, from which a light is emitted, " $R_2$ " is a second reflectance of a second cavity facet opposite to said first

cavity facet, " $\alpha_m$ " is a mirror loss, and "n" is a number of said at least one quantum well.

123. (previously presented) The semiconductor device as claimed in claim 122, wherein said semiconductor device has a cavity length "L" of not less than 1000 micrometers, and said first reflectance " $R_1$ " is not more than 20%, said second reflectance " $R_2$ " is not less than 80% and less than 100%, and said slope efficiency "S" satisfies  $S < 2.1/n$  (W/A).

124. (previously presented) The semiconductor device as claimed in claim 121, wherein said semiconductor device has an internal loss " $\alpha_i$ " ( $\text{cm}^{-1}$ ) which satisfies  $\alpha_i > 12 \times n - \alpha_m$  ( $\text{cm}^{-1}$ ), where " $\alpha_m$ " is a mirror loss, and "n" is a number of said at least one quantum well.

125. (previously presented) The semiconductor device as claimed in claim 121, wherein said semiconductor device has a photo-luminescence peak wavelength distribution of not more than 40 meV in said active layer.

126-128. (canceled)

129. (new) The semiconductor device as claimed in claim 71, wherein the microscopic fluctuations are not less than 20 meV.

130. (new) The semiconductor device as claimed in claim 71, wherein a dispersion degree of a thermal carrier in said

active layer is estimated by varying a temperature measurement, so as to determine said microscopic fluctuation.

131. (new) The semiconductor device as claimed in claim 71, wherein, when light is illuminated on a surface of the semiconductor device, the microscopic fluctuation is mesurable based on a photo-luminescence life-time.